September 13, 2001

Mr. Sandy Baker
Site Manager
BWXT of Ohio, Inc.
1 Mound Road
P.O. Box 3030
Miamisburg, Ohio 45343-3030

Dear Mr. Baker:

This letter responds to your February 27, 2001, request for exemption from certain provisions contained in Title 10 of the Code of Federal Regulations, Part 835 (10 CFR 835), "Occupational Radiation Protection." Specifically, this response concerns your request for exemption from provisions contained in 10 CFR 835 as they apply to monitoring exposures to radon and its decay products in controlled areas. The purpose of the exemption request was to obtain relief from requirements due to the inherent difficulties in discerning background exposure from occupational exposure to radon and its decay products.

The Office of Safety and Health conducted a technical review of the exemption request (enclosed). Discussions concerning the specifics of the exemption request were held with the Department of Energy (DOE) and your staff. In addition, on May 1, 2001, in response to an Office of Worker Protection Policy and Programs request, your staff provided a cost analysis detailing the projected cost savings from granting the exemption request. On June 8, 2001, the DOE Ohio Field Office forwarded your request recommending approval. Based on our review of the materials that were provided, the DOE is granting an exemption, with conditions, from several provisions of 10 CFR 835 as they relate to monitoring workers= exposure to radon and its decay products.

The enclosed technical review provides additional information concerning the exemption decision.

The DOE Ohio Field Office and the Office of Environmental Management concur with this exemption decision.

Sincerely,

Original signed by

Steven V. Cary
Acting Assistant Secretary
Office of Environment, Safety and Health

2 Enclosures

cc w/enclosures:
See attached list
cc w/enclosures:
Jessie M. Roberson, EM-1
Susan R. Brechbill, DOE-Ohio
Keith Christopher, DOE/EH-10
Docketing Clerk, DOE/EH-10
Radiological Control
Coordinating Committee
Price Anderson Amendments
Act Coordinator - Mound

Technical Position

BWXTO Radon/Thoron
Title 10 of the Code of Federal Regulations, Part 835 (10 CFR 835)
Exemption Request

BWX Technologies of Ohio (BWXTO), Inc., the contractor for the Mound site, seeks relief from various requirements contained in 10 CFR 835, "Occupational Radiation Protection," for monitoring and posting of areas and monitoring of individuals associated with occupational exposure to radon and/or thoron and their progeny. The Office of Environment, Safety and Health previously issued exemption decisions granting similar exemption requests from five other contractors: the Formerly Utilized Sites Remedial Actions Programs (FUSRAP) (contractor: Bechtel National, Inc.); Uranium Mill Tailings Remedial Act (UMTRA) (contractor: M.K. Ferguson); Grand Junction Program Office (GJPO) (contractor: RUST/Geotech, Inc.); Weldon Springs Site Remedial Action Project (WSSRAP) (contractor: M.K. Ferguson); and Fernald Environmental Remediation Management Corporation (FERMCO). This alone does not constitute a reason for granting BWXTO a similar exemption. However, the technical basis for the determination that granting the exemption is consistent with the safe operation of a nuclear facility would be the same. Accordingly, rather than repeat the entire technical evaluation, copies of the previous radon exemption technical positions are available at http://tis.eh.doe.gov/whs/rhmwp/exemption.html.

As discussed below, relief from specific provisions of 10 CFR 835 is justified. The Department of Energy (DOE) Office of Worker Protection Policy and Programs (EH-52) recommends providing exemption to those sections of 10 CFR 835 as specifically discussed in this technical position.

Discussion of Exemption Request

General

BWXTO submitted a request for exemption from seven provisions in 10 CFR 835 that deal directly with inherent problems in posting and personal monitoring for radon (Rn-222) and/or thoron (Rn-220) and their progeny.

Note: Hereinafter, all references to Aradon@ shall mean radon and/or thoron and their progeny.

Requirements From Which Exemption is Sought

'835.1(b)
Except as discussed in paragraph (c) of this section, the requirements of this part do not apply to:

(6) Background radiation, radiation doses received as a patient for the purposes of medical diagnosis or therapy, or radiation doses received from participation as a subject in medical research programs.

'835.2(a)
Airborne radioactivity area means any area, accessible to individuals, where:

(1) The concentration of airborne radioactivity, above natural background, exceeds or is likely to exceed the derived air concentration (DAC) values listed in appendix A or appendix C of this part;

Occupational dose means an individual's ionizing radiation dose (external and internal) as a result of that individual's work assignment. Occupational dose does not include doses received as a medical patient or doses resulting from background radiation or participation as a subject in medical research programs.

Radiological worker means a general employee whose job assignment involves operation of radiation producing devices or working with radioactive materials or who is likely to be routinely occupationally exposed above 0.1 rem (0.001 sievert) per year total effective dose equivalent.

'835.202(c) Doses from background, therapeutic and diagnostic medical radiation, and participation as a subject in medical research programs shall not be included in dose records or in the assessment of compliance with the occupational dose limits.

'835.402(c) For the purpose of monitoring individual exposures to internal radiation, internal dose evaluation programs (including routine bioassay programs) shall be conducted for:

(1) Radiological workers who, under typical conditions, are likely to receive a committed effective dose equivalent of 0.1 rem (0.0001 sievert) or more from all occupational radionuclide intakes in a year.

'835.403(a) Monitoring of airborne radiation shall be performed:

(1) When an individual is likely to receive an exposure of 40 or more DAC-hours in a year;

Results of Analysis

Discussion

Radon comes from the radioactive decay of uranium, which is naturally present in the soil. It is a gas which can migrate into the workplace through building foundation penetrations. Changes in environmental conditions (including barometric pressure changes and rainfall) as well as changes in building ventilation cause significant fluctuations in the concentrations of radon in buildings. The average annual dose from this background radiation is approximately 200 mrem. However, depending on many factors, including geographic location (some areas have higher levels of uranium in the soil) and how often and when the building spaces are occupied, the dose from background radon could be significantly higher or lower.

Some DOE sites have historically used material with enhanced concentrations of uranium. The radon which results from the decay of this uranium is not considered background radiation. Exposure to this radon is considered to be an occupational exposure. Individuals internal dose must be monitored if they are likely to receive an occupational exposure of 100 mrem or more in a year. Since the natural background annual dose is higher than the occupational monitoring threshold and the natural background levels can vary greatly, sites with locations containing sources of enhanced uranium have difficulty in differentiating background exposure to radon from occupation exposure to radon in these locations.

The following specific issues were raised in BWXTO's exemption request:

Due to the difficulty in differentiating between occupational and background exposure from radon, BWXTO requests an exemption from the requirement to monitor an individual's exposure to internal radiation based upon their likelihood to receive 0.1 rem committed effective dose equivalent (CEDE). BWXTO requests the monitoring threshold be raised to 0.5 rem CEDE and requests permission to include all exposures from exposure to radon in controlled areas, including background, in dose records or in the assessment of compliance with the occupational dose limits.

BWXTO requests an exemption from having to conduct air monitoring where an individual is likely to receive an exposure of 40 or more DAC-hours in a year. BWXTO proposes to conduct air monitoring for radon when an individual is likely to receive an exposure of 200 or more DAC-hours in a year. This is consistent with raising the threshold for monitoring internal exposure to 0.5 rem.

BWXTO requests an exemption from the definitions of "Airborne Radioactivity Area" and "Occupational Dose" to exclude radon in controlled areas from the background exclusion.

BWXTO requests an exemption from the definition of ARadiological Worker@ being based upon an individual=s likelihood to receive 0.1 rem total effective dose equivalent. BWXTO requests the definition be revised to include a threshold of 0.5 rem CEDE from radon.

Radon presents unique problems associated with occupational radiation protection. One of these problems is that, unlike most other occupational exposures received while conducting DOE activities, radon is present in natural background. The concentrations of radon occurring in background vary with a variety of environmental factors, the time of day, and the time of year. This creates technical difficulties in differentiating occupational exposure from background exposure at sites where radon is present due to current or previous DOE activities.

Subsequent to BWXTO=s February 27, 2001, submittal of their exemption request, on April 11, 2001, Office of Worker Protection Policy and Programs staff met with DOE Ohio and DOE Miamisburg Environmental Management Project (MEMP) and BWXTO staff to discuss the exemption request. Part of the basis for the BWXTO exemption request was that complying with the current requirements would result in resource impacts which are not justified by the

safety improvements. EH-52 requested a cost analysis that discussed the magnitude of the resource impact of complying with the current requirements and cost savings of granting the exemption request. In response, on May 1, 2001, BWXTO submitted to MEMP a cost analysis detailing the projected cost savings from granting the exemption. The cost analysis estimated an annual cost avoidance of approximately $113,000 (the estimated cost avoidance over the life of the project is over $800,000) from granting the exemption. The cost savings primarily resulted mostly from not having to develop site specific equilibrium fractions for numerous locations and minimizing the number of individuals who would need to have their radon exposure monitored and recorded.

Concurrence

Relief from monitoring requirements should be provided. This is in recognition of a technology shortfall of current instrumentation and monitoring techniques in being able to distinguish background levels of radon from levels created as a result of DOE activities.

EH-52 believes an appropriate approach would be to raise the monitoring threshold and require that all radon exposure received as a result of the employees' work assignment in a controlled area at the Mound site be assessed as an occupational exposure.

The issue would best be addressed for radiological workers by including background contributions from exposure to radon in occupational dose while in a controlled area at the Mound site. Another revision would be changing appropriate monitoring thresholds contained in 10 CFR 835 from 100 mrem to 500 mrem CEDE.

These thresholds and modified definitions would include:

- Redefining the definition of ABackground@ to delete radon and its progeny (10 CFR 835.2(a)) in a controlled area. This change would preclude the need for four of the seven provisions specified in the exemption request.

- Revising monitoring thresholds for radiological workers= internal exposure and air monitoring (10 CFR 835.2(a), 10 CFR 835.403(a), and '835.402(c)(1)).

The 500 mrem monitoring threshold for radiological workers= internal exposure should include all contributions from sources of radon, including background, while in a controlled area. The following exemptions should be granted for the following reasons (revised text in strikeout/italic):

1. Revising the definition of background ['835.2(a)]:

   Due to the diurnal, geographic, and seasonal variations in background levels of radon, differentiating occupational exposure from background exposure at the current monitoring threshold of 0.1 rem in a year is impractical in locations with technology enhanced concentrations of radon. Accordingly, for the purpose of determining occupational dose of individuals from radon while in a controlled area at the Mound site, the monitoring

threshold for occupational exposure to radon would be raised to 0.5 rem in a year. All exposure to radon while in a controlled area at the site would be included in individual occupational exposure monitoring results.

The effect of revising the definition of background is that BWXTO would not need exemption, as requested, from the following provisions:

'835.1(b)(6), exclusion of background levels of radon in controlled areas;
'835.2(a), definition of Airborne radioactivity area;
'835.2(a), definition of Occupational dose;
'835.202(c), exclusion of doses from background in dose records or in the assessment of compliance with the occupational dose limits.

Recommended revised text:

Background means radiation from:

(i) Naturally occurring radioactive materials which have not been technologically enhanced;
(ii) Cosmic sources;
(iii) Global fallout as it exists in the environment (such as from the testing of nuclear explosive devices);
(iv) Radon and its progeny, *located outside of a controlled area,* in concentrations or levels existing in buildings or the environment which have not been elevated as a result of current or prior activities; and
(v) Consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation.

2. Revising the definition of Radiological worker ['835.2(a)]:

The definition of a radiological worker would be modified to be consistent with the modification of the monitoring threshold for radiological workers.

Recommended revised text:

Radiological worker means a general employee whose job assignment involves operation of radiation producing devices or working with radioactive materials or who is likely to be routinely occupationally exposed above 0.1 rem (0.001 sievert) per year total effective dose equivalent *from sources other than occupational exposure to radon at the Mound site. In the case of occupational exposures to radon at the Mound site, a radiological worker means a general employee whose routine occupational exposure, while in a controlled area, is likely to exceed 0.5 rem (0.005 sievert) per year committed effective dose equivalent.*

3. Raising the monitoring threshold of radiological workers occupationally exposed to radon at the Mound site ['835.402(c)]:

Consistent with the discussion regarding technical difficulties associated with differentiating occupational exposure from background levels of radon, the threshold for monitoring radiological workers' exposure to radon would be raised to 500 mrem CEDE. This is consistent with monitoring thresholds under U.S. Nuclear Regulatory Commission radiation

protection regulations (10 CFR 20.1502 (a)). The revised definition of Abackground@ requires that this threshold includes all occupational exposure to radon.

The 500 mrem CEDE monitoring threshold for radiological workers' exposure to radon would be independent of the 100 mrem CEDE threshold for all other radionuclides. Therefore, if the radiological worker is exposed to radon and other radionuclides during the year, the 500 mrem CEDE monitoring threshold would apply only to radon and the remaining radionuclides would still have a 100 mrem CEDE monitoring threshold.

Recommended revised text:

For the purpose of monitoring individual exposures to internal radiation, internal dose evaluation programs (including routine bioassay programs) shall be conducted for:

(1) Radiological workers who, under typical conditions, are likely to receive a committed effective dose equivalent of:

(i) *0.5 rem (0.005 sievert) or more from all occupational intakes of radon while in a controlled area at the Mound site.*
(ii) 0.1 rem (0.0001 sievert) or more from all occupational radionuclide intakes in a year.

BWXTO must document in their Radiation Protection Program their evaluation that no unmonitored individual at the site, outside of controlled areas, would be likely to receive an occupational dose, from radon, exceeding the monitoring thresholds of 10 CFR 835 Subpart E. The evaluation should address exposures outside of controlled areas resulting from radon enhanced from DOE activities migrating from controlled areas. It must also address the adequacy of site characterization to properly locate and quantify sources of radon outside of controlled areas that were enhanced from DOE activities.

4. Raising the air monitoring threshold [' 835.403(a)]:

Consistent with the internal dose monitoring threshold, the air monitoring threshold for radon would be raised from 40 or more DAC-hours in a year to 200 or more DAC-hours in a year for occupational exposure to radon at the Mound site. These levels correlate with raising the threshold from 100 mrem to 500 mrem CEDE.

The 200 DAC-hour air monitoring threshold for exposures to radon would be independent of the air monitoring threshold for all other radionuclides. Therefore, if a mixture of radon and other airborne radionuclides existed, the radon air monitoring threshold would apply separately. The remaining mixture would continue to have its 40 DAC-hour monitoring threshold.

Recommended revised text:

Monitoring of airborne radiation shall be performed:

(1) When an individual is likely to receive an exposure of 40 or more DAC-hours in a year *or 200 or more DAC-hours in a year from occupational exposure to radon while in a controlled area at the Mound site*;

The above four changes would not affect the exposure limits and monitoring thresholds for minors and members of the public in controlled areas.

Conclusion

The above exemptions meet the criteria for granting a permanent exemption under 10 CFR 820.62:

1. Granting these exemptions would be authorized by law.

2. These exemptions would not present an undue risk to public health and safety, the environment, or facility workers.

3. The exemptions would be consistent with the safe operation of a DOE nuclear facility.

4. In granting these exemptions pursuant to '820.62(d)(2), the DOE recognizes that special circumstances exist where the application of the requirements discussed above would result in adverse resource impacts with no safety improvement.

Based on the above, EH-52 concurs that significant savings could be achieved through granting the exemption with no decrease in the effectiveness of the BWXTO radiation protection program.

EXEMPTION DECISION

Pursuant to title 10 of the Code of Federal Regulations, part 820.61 (10 CFR 820.61), the Assistant Secretary for Environment, Safety and Health (EH-1) is authorized to exercise authority on behalf of the Department of Energy (DOE) with respect to requests for exemptions from nuclear safety rules relating to radiological protection of workers, the public, and the environment.

On February 27, 2001, BWX Technologies of Ohio (BWXTO), Inc., the contractor for the DOE Mound site, filed a request with the Department for permanent exemption from certain requirements of Title 10 of the Code of Federal Regulations, Part 835 (10 CFR 835), "Occupational Radiation Protection."

In particular, BWXTO requested relief from seven provisions in 10 CFR 835 for monitoring and posting of areas and monitoring of individuals associated with occupational exposure to radon (Rn-222) and/or thoron (Rn-220) and their progeny. Hereinafter, all references to Aradon@ shall mean radon and/or thoron and their progeny.

The request states that the exemption is not prohibited by law; will not present an undue risk to the public health and safety, the environment, or facility workers; and is consistent with the safe operation of a DOE nuclear facility.

Under the terms set forth in 10 CFR 820.61, I am the Secretarial Officer granted review and approval authority for exemption requests made with respect to 10 CFR 835. Based on a review of the supporting documentation, I find that the request set forth above has been justified for relief. Specifically, I find that the exemption criteria of 10 CFR 820.62 have been met. I have determined that the exemption meets the special circumstances, described in the technical position prepared by the Office of Worker Protection Policy and Programs (EH-52), that constitute a sufficient basis upon which to grant this exemption.

On the basis of the foregoing, I hereby approve BWXTO's request for exemption from the following sections of 10 CFR 835, with conditions:

'835.2(a), definition of radiological worker;
'835.402(c)(1), monitoring of radiological workers;
'835.403(a)(1), monitoring of airborne radiation;

and I grant BWXTO an exemption (with conditions) from '835.2(a), definition of background.

Conditions:

1. BWXTO shall revise their Radiation Protection Program as follows:

Original text	Revised text in strikeout/italic
'835.2(a) Background means radiation from: (i) Naturally occurring radioactive materials which have not been technologically enhanced; (ii) Cosmic sources; (iii) Global fallout as it exists in the environment (such as from the testing of nuclear explosive devices); (iv) Radon and its progeny in concentrations or levels existing in buildings or the environment which have not been elevated as a result of current or prior activities; and (v) Consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation.	'835.2(a) Background means radiation from: (i) Naturally occurring radioactive materials which have not been technologically enhanced; (ii) Cosmic sources; (iii) Global fallout as it exists in the environment (such as from the testing of nuclear explosive devices); (iv) Radon and its progeny, *located outside of a controlled area,* in concentrations or levels existing in buildings or the environment which have not been elevated as a result of current or prior activities; and (v) Consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation.
'835.2(a) Radiological worker means a general employee whose job assignment involves operation of radiation producing devices or working with radioactive materials or who is likely to be routinely occupationally exposed above 0.1 rem (0.001 sievert) per year total effective dose equivalent.	'835.2(a) Radiological worker means a general employee whose job assignment involves operation of radiation producing devices or working with radioactive materials or who is likely to be routinely occupationally exposed above 0.1 rem (0.001 sievert) per year total effective dose equivalent *from sources other than occupational exposure to radon at the Mound site. In the case of occupational exposures to radon at the Mound site, a radiological worker means a general employee whose routine occupational exposure, while in a controlled area, is likely to exceed 0.5 rem (0.005 sievert) per year committed effective dose equivalent.*

'835.402(c): For the purpose of monitoring individual exposures to internal radiation, internal dose evaluation programs (including routine bioassay programs) shall be conducted for: (1) Radiological workers who, under typical conditions, are likely to receive a committed effective dose equivalent of 0.1 rem (0.0001 sievert) or more from all occupational radionuclide intakes in a year.	'835.402(c): For the purpose of monitoring individual exposures to internal radiation, internal dose evaluation programs (including routine bioassay programs) shall be conducted for: (1) Radiological workers who, under typical conditions, are likely to receive a committed effective dose equivalent of*:* *(i) 0.5 rem (0.005 sievert) or more from all occupational intakes of radon while in a controlled area at the Mound site.* *(ii)* 0.1 rem (0.0001 sievert) or more from all occupational radionuclide intakes in a year. *BWXTO is to document their determination that no unmonitored individual at the site, outside of controlled areas, would be likely to receive an occupational dose, from radon, exceeding the monitoring thresholds of 10 CFR 835 Subpart E. The evaluation is to address exposures outside of controlled areas resulting from radon enhanced from DOE activities migrating from controlled areas. It is also to address the adequacy of site characterization to properly locate and quantify sources of radon outside of controlled areas which were enhanced from DOE activities.*
'835.403(a) Monitoring of airborne radiation shall be performed: (1) When an individual is likely to receive an exposure of 40 or more DAC-hours in a year;	'835.403(a) Monitoring of airborne radiation shall be performed: (1) When an individual is likely to receive an exposure of 40 or more DAC-hours in a year *or 200 or more DAC-hours in a year from occupational exposure to radon while in a controlled area at the Mound site*;

2. The 500 mrem CEDE monitoring threshold for radiological workers' exposure to radon is independent of the 100 mrem CEDE threshold for all other radionuclides. If a radiological worker is exposed to radon and other radionuclides during the year, the 500 mrem CEDE monitoring threshold would apply only to radon and the remaining radionuclides would still have a 100 mrem CEDE monitoring threshold.

3. The 200 DAC-hour air monitoring threshold for exposures to radon is independent of the 40 DAC-hour threshold for all other radionuclides.

4. The exposure limits and monitoring thresholds for minors and members of the public in controlled areas are not changed.

Pursuant to 10 CFR 820.66, BWXTO has 15 days from the date of the filing of this decision to file a Request to Review with the Secretary. The Request to Review shall state, specifically, the respects in which the exemption determination is claimed to be erroneous, the grounds of the request, and the relief requested. If no Request to Review is submitted, the exemption decision becomes a final order 15 days after it is filed.

September 7, 2001
Date

Original signed by
Steven V. Cary
Acting Assistant Secretary
Office of Environment, Safety and Health